

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 701.342	FOR FURTHER ACTION See Form PCT/IPEA/416	
International application No. PCT/EP2004/003728	International filing date (day/month/year) 07.04.2004	Priority date (day/month/year) 07.04.2004
International Patent Classification (IPC) or national classification and IPC B23Q1/01, B23Q1/62		
Applicant HPT SINERGY S.R.L. et al.		
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 4 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> (<i>sent to the applicant and to the International Bureau</i>) a total of 16 sheets, as follows:</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions). <input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box. <p>b. <input type="checkbox"/> (<i>sent to the International Bureau only</i>) a total of (indicate type and number of electronic carrier(s)), containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>		
<p>4. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Box No. I Basis of the opinion <input type="checkbox"/> Box No. II Priority <input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability <input type="checkbox"/> Box No. IV Lack of unity of invention <input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement <input type="checkbox"/> Box No. VI Certain documents cited <input type="checkbox"/> Box No. VII Certain defects in the international application <input type="checkbox"/> Box No. VIII Certain observations on the international application 		
Date of submission of the demand 07.02.2006	Date of completion of this report 07.03.2006	
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Lasa, A Telephone No. +49 89 2399-2641	



**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/EP2004/003728

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
 - This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
 - international search (under Rules 12.3 and 23.1(b))
 - publication of the international application (under Rule 12.4)
 - international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements*** of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):

Description, Pages

1	as originally filed
2-6	received on 07.02.2006 with letter of 06.02.2006

Claims, Numbers

1-12	received on 07.02.2006 with letter of 06.02.2006
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Drawings, Sheets

1/8-8/8	received on 07.02.2006 with letter of 06.02.2006
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a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. The amendments have resulted in the cancellation of:
 - the description, pages
 - the claims, Nos.
 - the drawings, sheets/figs
 - the sequence listing (*specify*):
 - any table(s) related to sequence listing (*specify*):
4. This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
 - the description, pages
 - the claims, Nos.
 - the drawings, sheets/figs
 - the sequence listing (*specify*):
 - any table(s) related to sequence listing (*specify*):

* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/EP2004/003728

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-12
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-12
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-12
	No:	Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

**INTERNATIONAL PRELIMINARY
REPORT ON PATENTABILITY
(SEPARATE SHEET)**

International application No.

PCT/EP2004/003728

The subject-matter of claims 1-12 is new and inventive.

EP-1 362 664-A discloses the closest prior art according to the preamble of claim 1, with two columns (1.1, 1.2) of a portal lowerly connected through a crosspiece (5), from which the machine of claim 1 differs in that the at least one crosspiece is placed at a level at least partly lower than the upper surface of the bed.

The problem solved by this invention is to reduce the machine dimensions.

Since the stiffening crosspiece of the columns is partly lower than the upper surface of the bed, the column and thus the machine can be built smaller.

Starting from the machine disclosed in D1, whose column is mounted slidable on three guides, with a linear motor under the columns and the stiffening crosspiece (5), the skilled person does not get any hint to change the configuration of the machine, so that the crosspiece is built lower.

IAP2 Rec'd PCT/PTO 28 SEP 2006

- 2 -

for the bottom and side walls of the pit which is impermeable to the refrigeration and lubrication liquids normally used during machining, walkways for operator movement in proximity to the machine and/or workpiece, a conveyor for machining swarf and chippings, located in the 5 bottom of the pit, a tray provided in the bottom of the pit for collecting said refrigeration and lubrication liquids, and a bilge pump for transferring the liquids from the tray to the main machine tank;

- limited safety because of the presence of the pit: this drawback means that fixed or movable barriers must be used, able to protect only personnel 10 in transit not involved in the machining, but ineffective for the operators who, because of the presence of control members in the machine, have to work within the barrier-protected areas;

- the fact that the installation area is suitable only for this exclusive use; in reality, the pit could always be filled in and the floor of the room in which 15 the machine was installed be restored, however this would involve considerable difficulties and high costs for remaking the floor, and for repeating the operations involved in forming a new pit in a different area.

EP-1 362 664 describes a machine of the type with a mobile column along a bench in a horizontal axis X. The column has two halves which from 20 their top part, enlarges towards the base, forming a large base in which each half has primary with linear synchronous motor, with the secondary being longitudinally aligned on the bench, this bench having three linear guides which, with the tracks disposed in the base of the halves of the column, allows rapid displacement of the column along the axis X without requiring 25 the top guide of the column.

- 3 -

An object of the invention is to solve this problem by making it possible to install in particular a horizontal milling-boring machine without requiring excavation work, but at the same time such that the spindle axis 5 lies very close to the machine work table.

This and further objects which will be apparent from the ensuing description are attained, according to the invention, by a horizontal milling-boring machine with mobile column as claimed in claim 1.

Two preferred embodiments of the present invention are described in 10 detail hereinafter with reference to the accompanying drawings, in which:

Figure 1 is an overall schematic perspective view of a first embodiment of a milling-boring machine according to the invention,

Figure 2 shows it in the side view II-II of Figure 1,

Figure 3 shows it in the view III-III of Figure 2,

15 Figure 4 shows it in plan view,

Figure 5 shows a second embodiment thereof in the same perspective view as Figure 1,

Figure 6 shows it in the side view VI-VI of Figure 5,

Figure 7 shows it in the view VII-VII of Figure 6, and

20 Figure 8 shows it in plan view.

As can be seen from Figures 1-4, a first embodiment of the milling-boring machine of the invention is essentially a machine of known mobile column type, i.e. with a horizontal slide 2 movable axially and also movable vertically along a column structure 4, which itself is movable horizontally in a

- 4 -

direction perpendicular to the axis of the slide 2, along a bed 6 anchored to the floor 8.

More specifically, not only the bed 6 is anchored to the floor 8 but also a work table 10 separated from the bed and provided with grooves 12,

- 5 on which the workpiece 14 to be machined can be fixed in traditional manner.

The column structure 4 is of symmetrical portal type and comprises a pair of columns 16, which are joined together upperly by a crosspiece 18 and are prolonged lowerly into a pair of portions 19, the function of which is to support the column structure 4 on the bed 6 in a stabilized manner.

- 10 A carriage 22 supporting and axially guiding the slide 2 is slidable vertically along the facing inner walls of the columns 16. As the systems for vertically driving said carriage 22 are traditional, they do not require a more detailed description.

- 15 As stated, the carriage 22 supports the slide 2 and is provided with traditional members for guiding and driving this latter in an axial direction, i.e. in a horizontal direction perpendicular to the axis of the bed 6.

- 20 The vertical movement of the carriage 22 along the column structure 4 involves the entire inner opening of the column structure, bounded upperly by the crosspiece 18 and lowerly by the upper surface of the bed 6 or by a non structural thin connection between the two columns 16.

The column structure 4 slides along the bed 6 on guides 26, which can be positioned between the upper surface of the bed 6 and the lower surface of the column structure 4 (see Figure 2).

- 5 -

Likewise, the traditional members for driving the column structure along the bed 6 can consist of a male-female screw combination 28 positioned on the upper surface of the bed 6, or a linear electric motor.

The bed 6 comprises a wide longitudinal recess 36 defining two longitudinal projections 38, on the upper surface of which the guides 26 are applied. Correspondingly, each of the two lower portions 19 of the columns 16 is provided with a lower appendix 40 intended to slide along the longitudinal recess 36 of the bed 6. The two appendices are advantageously joined together by a connecting and stiffening portion, also housed slidably within the longitudinal recess 36.

The aforescribed machine is provided with traditional control systems enabling the tool head 34, mounted at that end of the slide 2 facing the work table 10, to undergo movement in accordance with the desired machining program which the machine has to carry out on the workpiece 14 positioned on the work table.

From the aforesaid it is apparent that the milling-boring machine of the invention is particularly advantageous compared with traditional machines, and in particular enables the spindle axis to reach a position very close to the work table 10 without the bed 6 having to be installed in a pit, and hence without requiring laborious and costly excavation work.

In addition it enables to further lessening the column dimensions and the rails 26 to be positioned between the facing lateral surfaces of the longitudinal recess 36 and of the appendices 40.

In the embodiment shown in Figures 5-8, in which corresponding parts are indicated by the same reference numerals, the two columns 16 of

- 6 -

the portal column structure 4 are joined together by a pair of lower crosspieces 20, which extend downwards to externally embrace the two sides of the bed 6. These two lower crosspieces 20 define a portion positioned outside the corresponding side of the bed and extending upperly
5 to join the two columns 16.

In this embodiment the driving members of the column structure 4 along the bed 6 can consist of a pinion 30/rack 32 combination positioned on the upper surface of the bed 6 or on a lateral surface of the bed 6.

This embodiment adds to the advantages of the preceding a greater
10 robustness and a greater ease of construction while, as in the case of the second embodiment, enabling the guide rail 26 to be interposed between outer lateral surfaces of the bed 6 and the facing lateral surfaces of the lower crosspieces 20.

C L A I M S

1. A horizontal milling-boring machine comprising:
 - a monolithic horizontal bed (6) anchored to the floor (8) and separated from the work table (10),
 - a portal formed column structure (4) supported by the bed (6) and slidable therealong, said portal having two columns (16) connected together by an upper crosspiece (18)
 - a slide carriage (22) slidable vertically along the facing internal walls of said columns (16)
 - a slide (2) supporting a tool head (34) and movable axially to said carriage (22) in a direction perpendicular to the axis of said bed (6),
 - guide means (26) and drive means (28, 30, 32) being interposed between said column structure (4) and said bed (6).
- 15 characterised in that the two columns (16) of the portal are lowerly connected through at least a crosspiece (20) placed at a level at least partly lower than the upper surface of said bed (6).
2. A milling-boring machine as claimed in claim 1, characterised in that the guide means (26) consist of rails positioned on the upper surface of said bed (6).
- 20 3. A milling-boring machine as claimed in claim 1, characterised in that the guide means (26) consist of rails positioned on the lateral surfaces of said bed (6).

- 8 -

4. A milling-boring machine as claimed in claim 1, characterised in that the drive means consist of at least one screw and at least one threaded bush which mutually engage.

5. A milling-boring machine as claimed in claim 4, characterised in that the drive means consist of a rack (32) rigid with said bed (6) and at least one pinion (30) rigid with said portal (4).

6. A milling-boring machine as claimed in claim 4, characterised in that the drive means consist of a linear electric motor.

7. A milling-boring machine as claimed in one or more of claims from 4 to 10, characterised in that the drive means (28, 30, 32) are positioned on the upper surface of said bed (6).

8. A milling-boring machine as claimed in one or more of claims from 4 to 6, characterised in that the drive means (28, 30, 32) are positioned on at least one lateral surface of said bed (6).

15. 9. A milling-boring machine as claimed in claim 1, characterised in that the two columns (16) of the portal formed structure (4) are connected together lowerly by a pair of lower crosspieces (30) which laterally embrace said bed (6).

10. A milling-boring machine as claimed in claims 8 and 9, characterised in that the guide rails (26) are interposed between the outer lateral surfaces of said bed (6) and the inner lateral surfaces of said lower crosspieces (20).

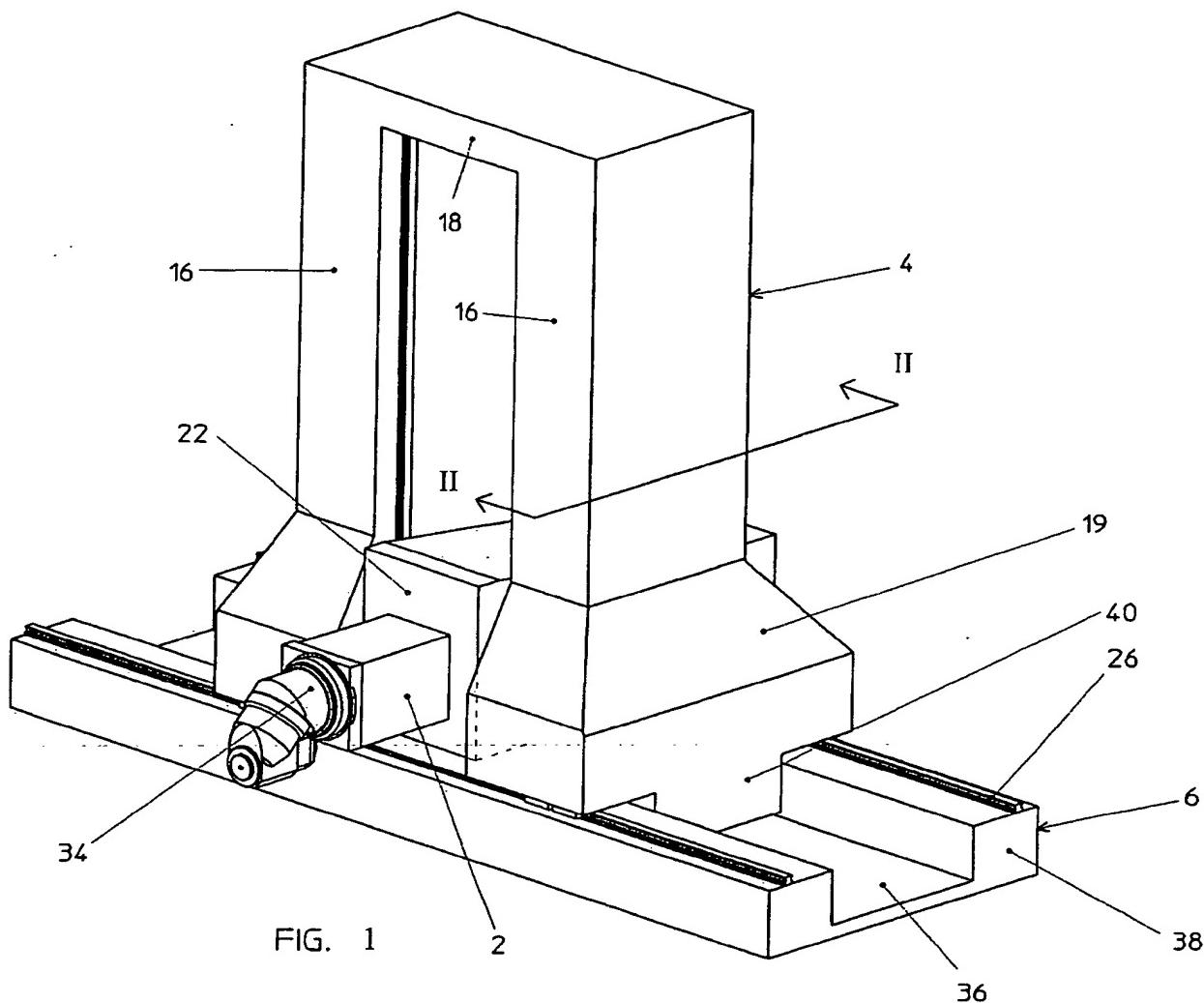
11. A milling-boring machine as claimed in claim 1, characterised in that the bed (6) comprises a longitudinal recess (36) within which corresponding lower appendices (40) of each column (16) and a connecting portion thereof

- 9 -

are slidably housed, said connecting portion being also slidably along said longitudinal recess (36)

12. A milling-boring machine as claimed in claim 11, characterised in that the guide rails (26) are interposed between the internal lateral surfaces of
5 said recess (36) and the facing external lateral surfaces of said appendices (40).

1/8



2/8

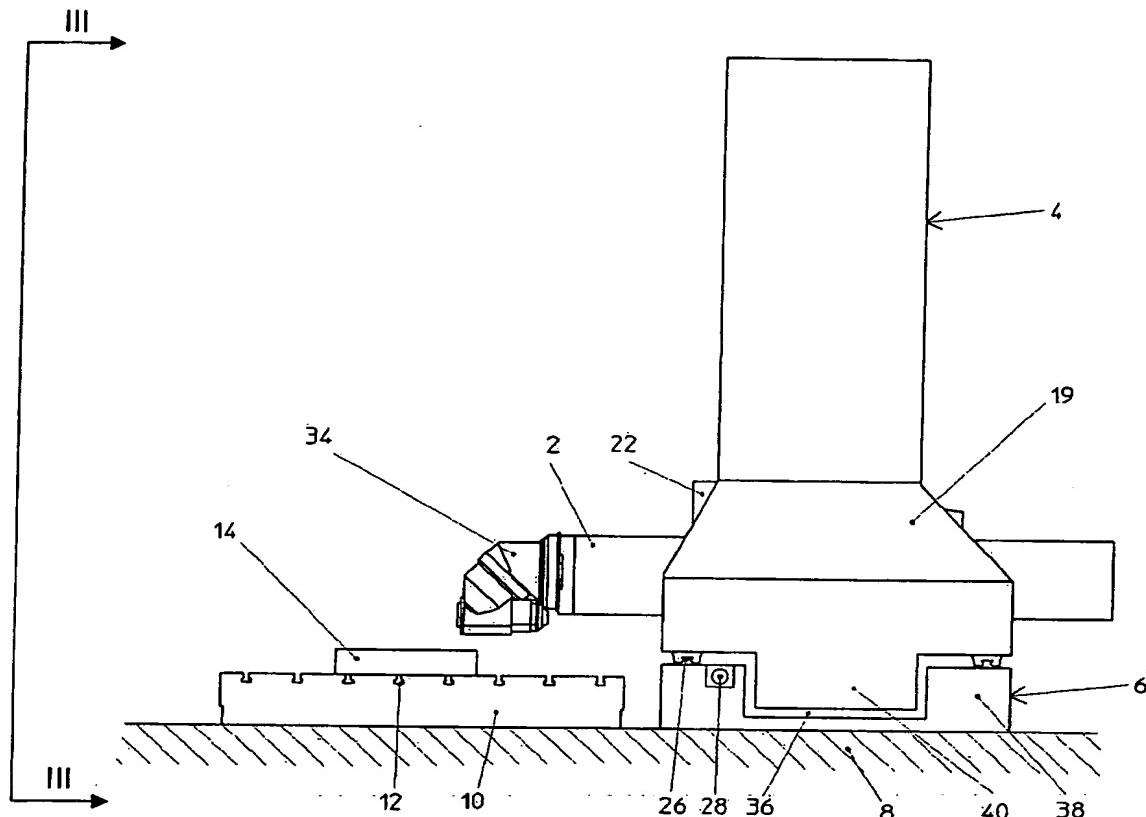


FIG. 2

3/8

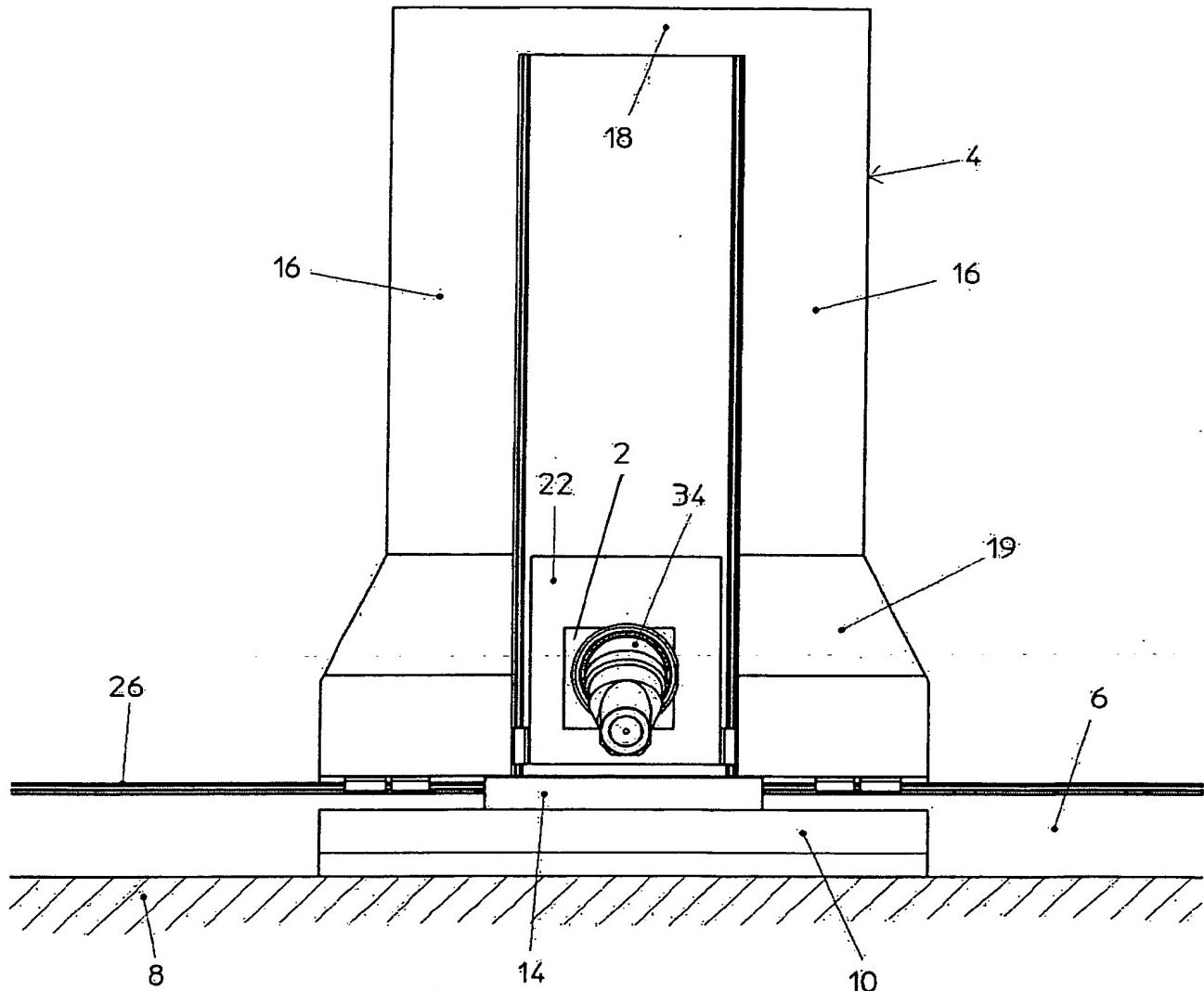


FIG. 3

4/8

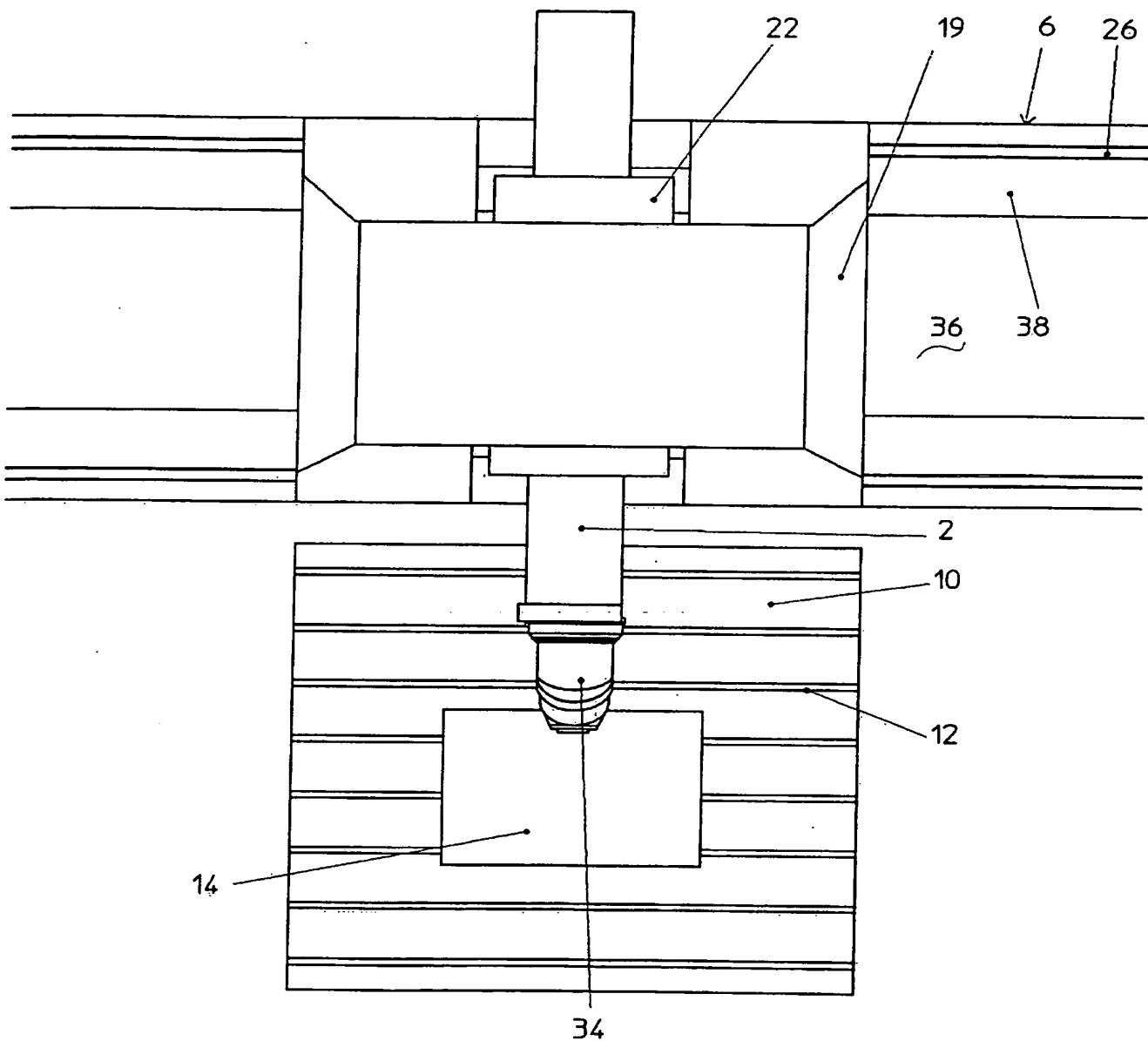


FIG. 4

5/8

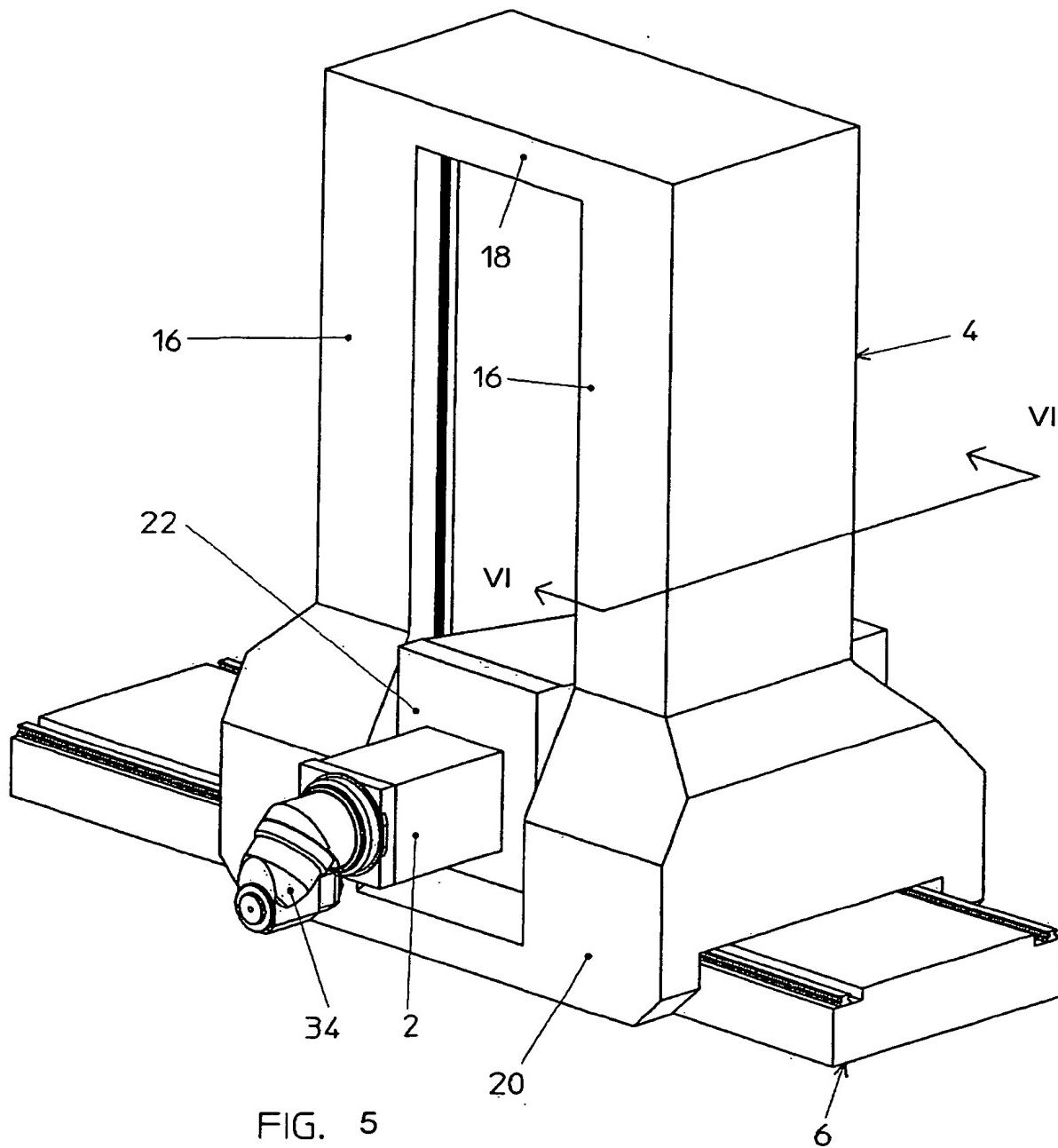


FIG. 5

6/8

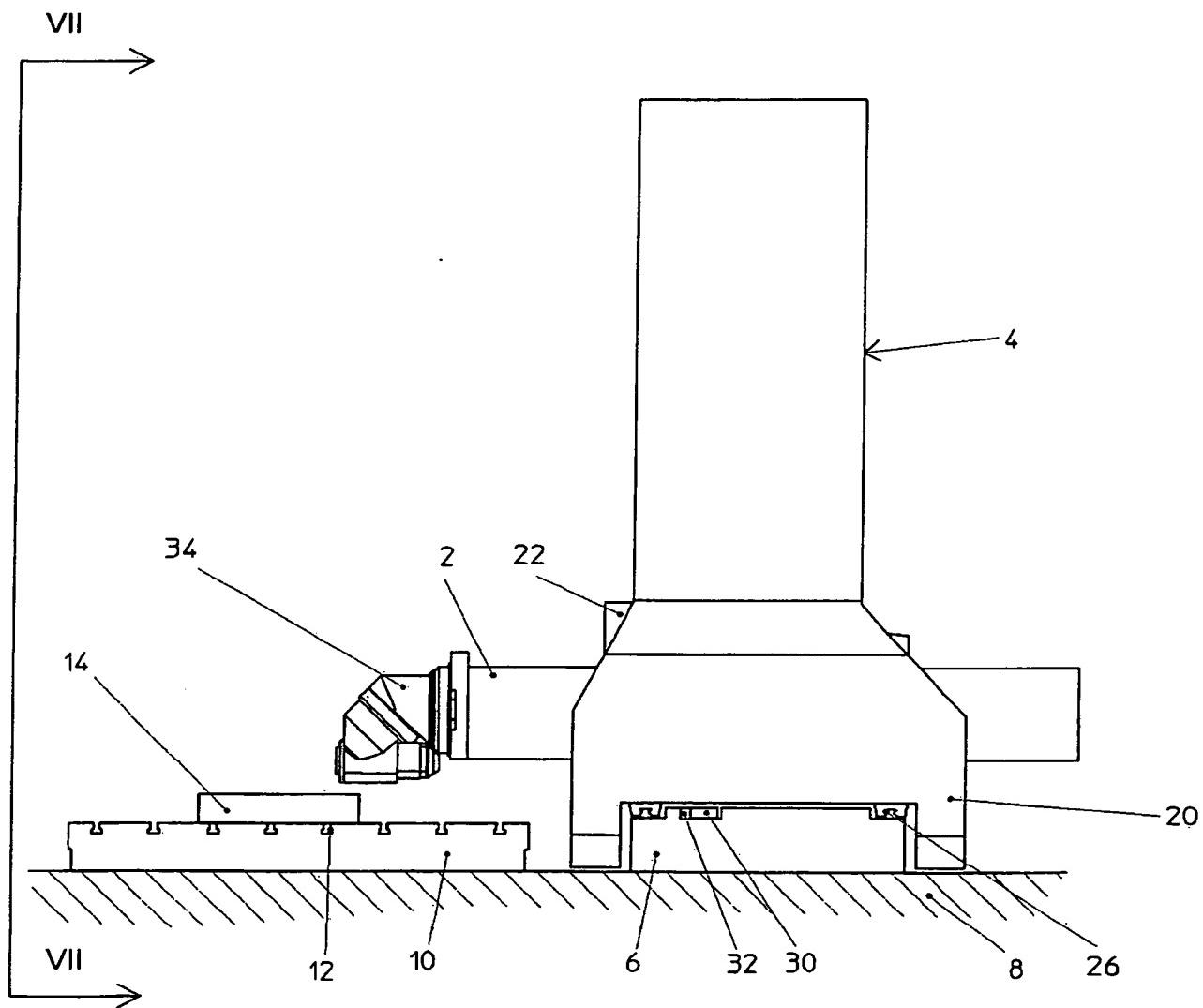


FIG. 6

7/8

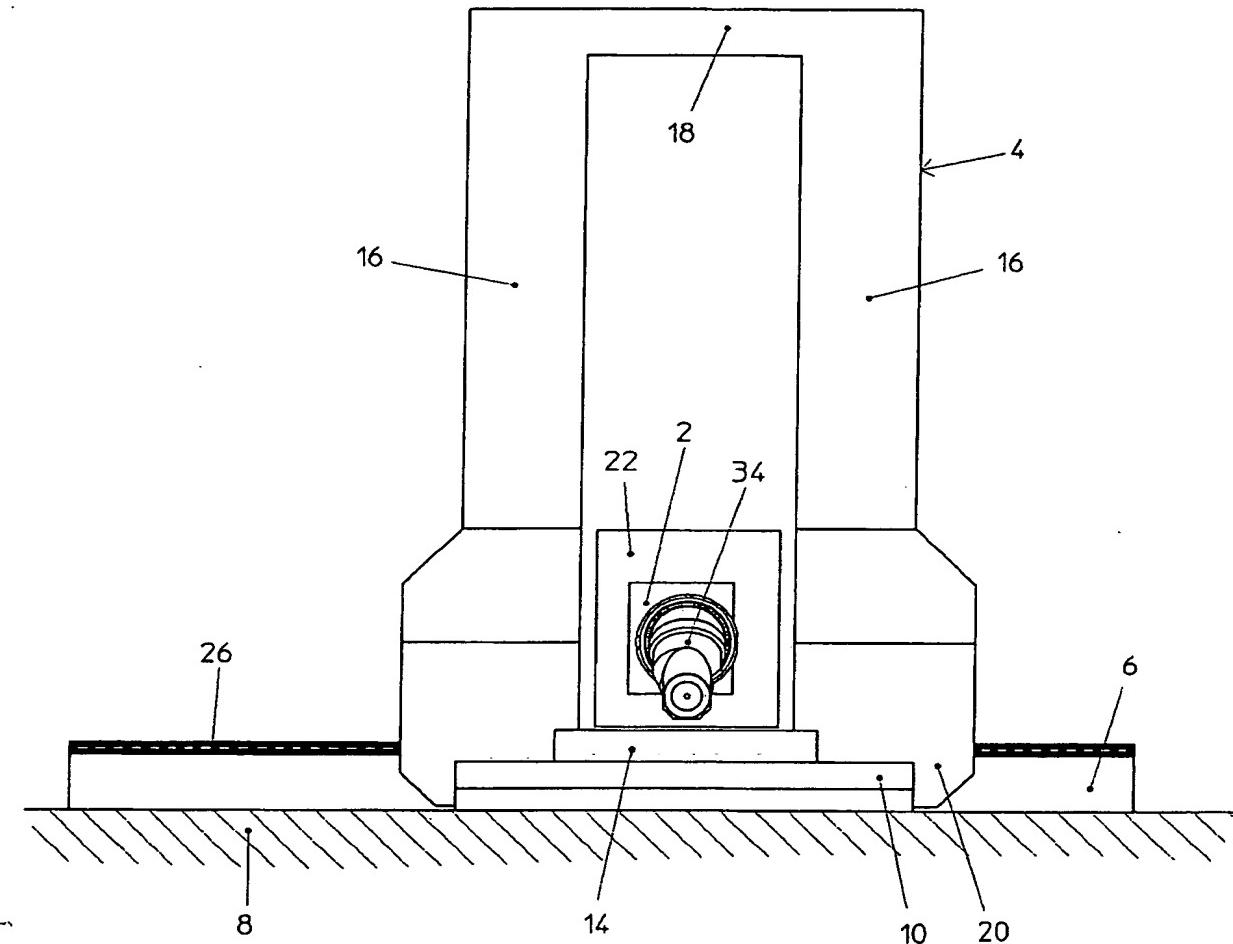


FIG. 7

8/8

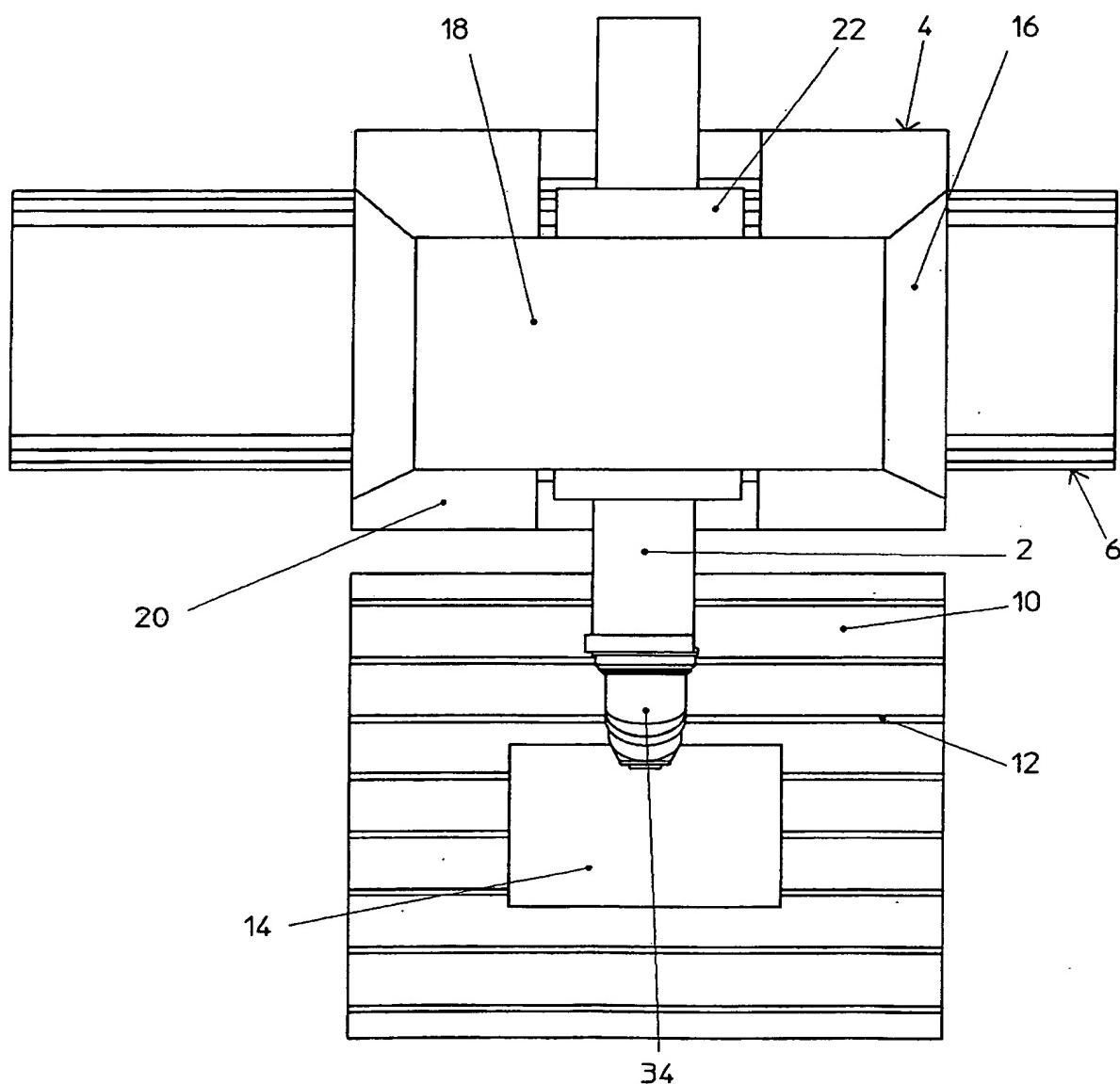


FIG. 8